

Composite Textile Material

Background of the Invention

5 1. Field of the Invention

The invention relates to composite textile materials.

10 2. Description of Prior Art

The invention relates more particularly to composite textile materials that have applications in moisture management. Basically, there is an on-going requirement to make clothing, especially sports clothing, diapers and incontinent apparel and so forth more comfortable and healthier to wear and use, even though considerable moisture or liquids may be liberated by the wearer in normal use. It is known to provide composite textile materials that comprise distinct layers of materials having respective appropriate characteristics so that moisture, or liquid, migrates or drains quickly away from an inner surface of the material in contact with the body of a wearer. The liquid may be retained in a second outer layer in the case of a diaper or evaporate normally from an outer surface of the material where there is only one layer, in the case of sports clothing, say.

25

Considerable developments have already taken place in providing suitable materials. However difficulties remain especially with multi-layer materials because they are bulky and uncomfortable or certainly difficult to style fashionably. Also, even though the present materials may keep the wearer's skin relatively dry and comfortable in use at first, once an absorbent layer becomes saturated or relatively wet, the moisture or liquid may migrate back towards the body of the user. Presently used composite materials, especially where they are multi-layer, are usually not re-usable.

Summary of the Invention

It is an object of the invention to overcome or to at least reduce this problem.

According to the invention there is provided a composite textile fabric for use in moisture management of textiles and garments, the composite fabric comprising a generally uniformly integrated fabric layer formed with an inner exposed surface that is predominantly hydrophobic material and an outer surface that is predominantly hydrophilic material, whereby the fabric forms a one-way liquid transport system extending away from the inner surface towards the outer surface.

The hydrophilic material may be polypropylene.

The hydrophilic material may be one of polyester and cotton.

5 A re-usable diaper may be provided having an inner layer formed of the composite textile fabric a middle layer formed of treated cotton fabrics, and an outer layer formed of water-proof material.

10 A diaper may be provided having an inner layer formed of the composite textile fabric a middle layer formed of disposable absorbent material, and an outer layer formed of water-proof material.

15 Clothing may be provided with or formed of the composite textile fabric layer, such as boxer or long pants.

An incontinent mattress cover including may be provided with the composite textile fabric layer.

20

Brief Description of the Drawings

Composite textile fabric materials and their applications according to the invention will now be described by way of example with reference to the
25 accompanying drawings in which :-

Figure 1 is diagrammatic representation of a cross section of a diaper incorporating the composite textile

material;

Figure 2 is an enlarged cross-section of part of the composite material;

5

Figure 3 shows knitting instructions for forming the composite material;

Figure 4 is a front view of an open diaper;

10

Figure 5 is a plan view of a mattress cover;

Figure 6 is a front view of boxer shorts;

15

Figure 7 is a front view of long pants; and

Figure 8 is different representation of the material of Figure 2.

20

Description of the Preferred Embodiments

Composite textile fabrics and articles made with such materials according to the invention comprise a generally uniformly integrated layer that is formed by a combination of a hydrophobic material and a hydrophilic material. The combination can be made by a number of well-practiced techniques including knitting, weaving and other means, that are used for joining or retaining

25

materials together to form a fabric. In the formed composite fabric, an inner layer, that normally contacts against a body of a user, is made up predominately of hydrophobic textile material such as polypropylene. In contrast, the outer layer is made up predominately of hydrophilic material. Typically, the inner surface is constituted over its surface with a number of very small areas of the hydrophilic material distributed evenly in the surface of the outer layer. The small areas when totalled together make up typically about 25% of the overall area of the inner surface. When the inner surface is wetted, moisture migrates into the composite fabric via paths formed by hydrophilic material and away from the body of the user.

As such, the composite fabric acts as a one-way liquid transport system that takes moisture immediately away from the body of a user and holds the liquid in the hydrophilic material. Due to the physical distribution of the hydrophobic and hydrophilic materials within the fabric, there is no tendency under normal conditions for moisture, or liquid, to migrate towards the body of the user via the hydrophilic material. A further layer of absorbent material may be combined in the composite fabric or placed against the outer surface to increase the volume of liquid that can be retained, or in effect, stored in the fabric or an article, such as a diaper, incorporating the composite material.

It will be appreciated that the small areas of hydrophilic material may comprise a wide range of percentages of the overall exposed inner surface area of the fabric. Whereas 25° is generally satisfactory and efficient value, the percentage may be considerably higher or lower according to the required use and material or types of those materials that make up the hydrophobic and hydrophilic parts.

Referring to the drawings, in Figure 1 a typical arrangement of a diaper is shown. The composite material is provided as an inner layer 10 formed of hydrophobic material 10A and hydrophilic material 10B.

In practice the material 10A is actually uniformly "impregnated" with hydrophilic material 10B by weaving, knitting or any other techniques, so that an exposed upper surface of the layer 10 comprises small areas of the hydrophilic material. The small areas provide

passage or ducts for moisture, or liquids to migrate from the upper surface into the bulk of the hydrophilic material 10B of the composite layer. Because the

passages each have a small cross-section and are surrounded by hydrophobic material, the composite layer 10 acts as a one-way liquid transport system. An outer

absorbent storage layer 12 is provided to collect water from the bulk of the material 10B and a waterproof layer or cover 14 prevents moisture or water dispersing out of the diaper in an otherwise conventional manner.

Generally stated, there is no tendency or likelihood of liquid passing towards the exposed upper surface of the layer 10 material 10B to the material 10A, even under gravity during use, and so a surface of a wearer's skin
5 13 normally remains dry.

The layer 10 is re-usable (i.e. washable). For re-usable diapers, the layer 12 can be also be made of re-usable materials. On the other hand, where desired the
10 layer 12 can be made of disposable material and used only once. In this situation, the layer 12 is preferably separately applied or attached to the layer 10 and so that the layer 10 can re-used with a new different layer 12.

15 In another embodiment, the layer 12 is in effect combined with the layer 10, such that when the materials 10A and 10B are knitted or woven together, the layer 12 forms part of the composite layer 10 and is knitted or
20 woven into the layer 10. In that case, the inner surface is formed as before so as to be predominantly made up of hydrophobic material with a number of small exposed areas formed by the hydrophilic material.

25 In any event, the composite layer represents the main departure from the prior art and can be used separately or part of a diaper, an incontinent bed cover, underparts or undnerslips, and so forth. For

sportswear, the composite material alone can be made up into an article or be part of an article of clothing. Moisture that migrates into the material 10B will evaporate into the atmosphere in normal use and surface of the skin of the wearer will remain dry and comfortable.

In Figure 2, part of the upper surface of composite material layer 10 is shown. A strand of hydrophilic material 15 is interspaced with strands of hydrophilic material 16 so that the area (overall) of the upper surface is constituted of about 25% hydrophilic material. Each downward directed part of the strand 15 shown in the Figure represents a narrow passage or duct to transport moisture into the hydrophilic material that predominantly constitutes the lower surface of the composite layer.

Where the composite layer is formed by knitting, a suitable knitting structure is shown in Figure 3. The composite material is knitted on a multi-function cylinder and dial and two track knitting machine. Two filament yarns are used. The first yarn is a polypropylene filament yarn with a tenacity of 17.4 tex (double yarn of 8.7 tex) and the second yarn is polyester (Coolmax) filament yarn with a tenacity of 8.5 tex.

In Figure 4, the diaper is generally conventional but is provided with a layer 16 of the composite material. The layer 17 may be permanently attached to a re-usable diaper or insertable into a suitable pocket for example, for a disposable diaper. The layer 17 itself is re-usable.

In Figure 5, a removable layer 18 of composite material is arranged to fit to or centrally over an incontinent draw sheet or mattress cover formed otherwise of cotton fabric 19 with a central absorbent layer 20.

The composite material may also be used in a similar manner, preferably as an insertable layer in clothing such as boxer shorts shown in Figure 6 or long pants shown in Figure 7.

It will be appreciated that the term hydrophobic and hydrophilic are comparative terms and depend upon selection of fibres and yarn with different surface tension, contact angle, shape of cross section, diameters of fibres, chemical and physical finishing, and so forth. Thus it will be understood that the terms "hydrophobic" and "hydrophilic" are used in the specification and claims as relative terms. This means that the composite textile fabric is made up of materials that are hydrophobic and hydrophilic relative to one another rather than necessarily having such

properties in comparison to a norm or some industrial standard, for example.